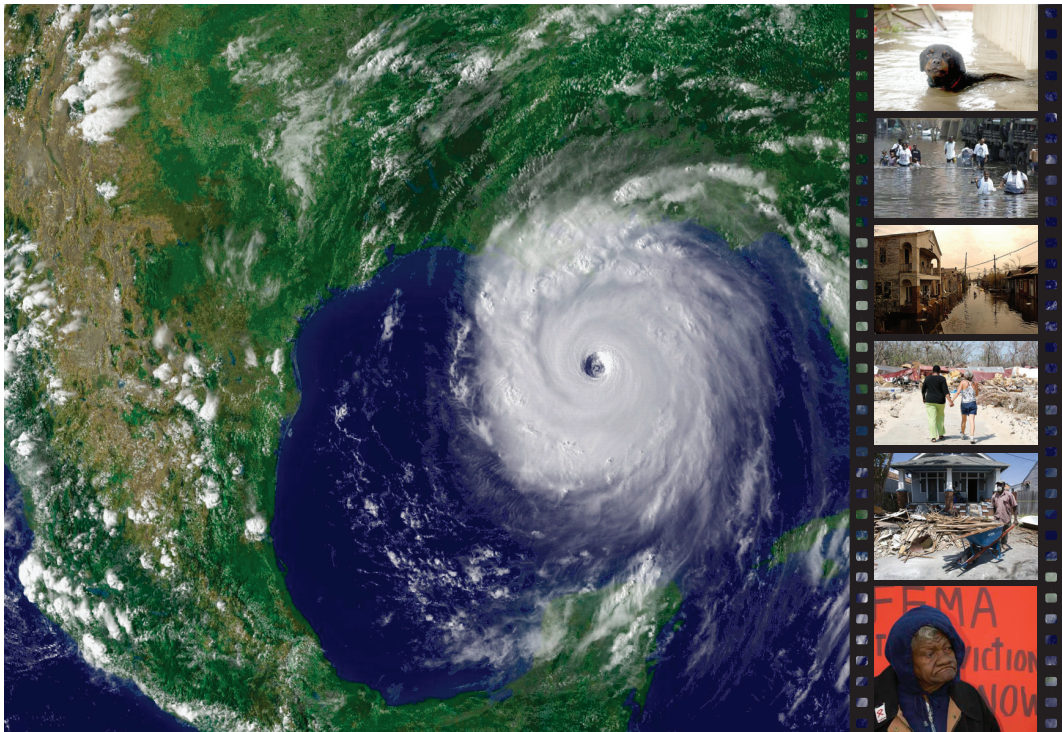
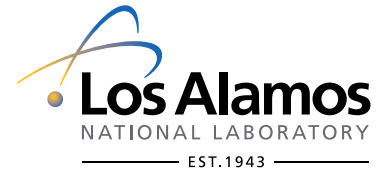


# CIP: Critical Infrastructure Protection

*Decision Support System (DSS)—Katrina, a Case Study*



Making the best decisions in the wake of catastrophic disasters is the key to a successful response rate for saving critical infrastructure. LANL's model incorporates the human behavioral component, a key element for risk management scenarios.

**Left:** Hurricane Katrina makes its landfall

**Inset:** Katrina's social impact is the focus of our study—how to model human behavioral response.

## Background

Decision makers need to understand the consequences of policy and investment options before they enact solutions. The most effective way is to utilize a decision support system that incorporates threat information, vulnerability assessments, and disruption consequences in quantitative analyses through advanced modeling and simulation. LANL has been developing a system dynamics model with the human component in mind—a critical element in determining the outcome of natural catastrophes—using the Hurricane Katrina evacuation as the control.

## Capabilities

We use a hybrid approach coupling a system dynamics model with an agent-based model. This approach allows us to capture the two different scales present in this multiscale problem—macroscopic and microscopic. The infrastructures and their interdependencies were modeled at a macroscopic level. The human behavioral component was modeled at a microscopic level using an agent-based simulation representing different social networks.

## Future Applications

This behavioral model can be extended and adapted to many scenarios and domains where human behavior and mechanism of information diffusion and adaptation are involved.

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**Right:** The light blue bars show the actual traffic evacuation during Hurricane Katrina. Our simulation (blue circles) closely mimics the real data.

